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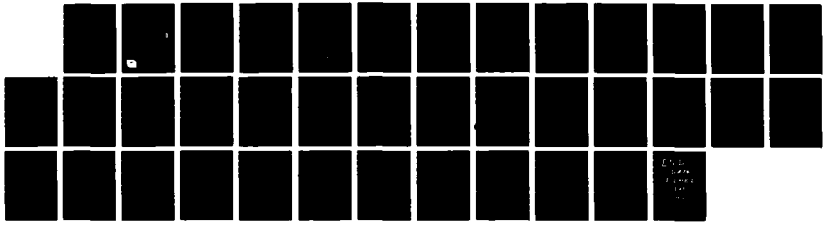

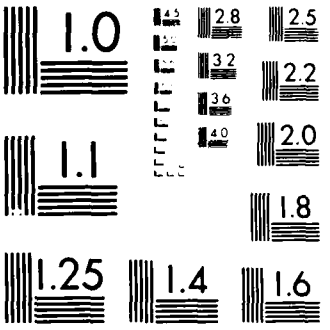

IDA MEMORANDUM REPORT M-137

AN ASSESSMENT OF THE STARS PROGRAM SEPTEMBER-OCTOBER 1985

Volume I
EXECUTIVE BRIEFING

Dr. Elizabeth Bailey
Dr. John Kramer
Dr. Robert Winner

December 1985

Prepared for

Office of the Under Secretary of Defense for Research and Engineering

INSTITUTE FOR DEFENSE ANALYSES
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The STARS Program Plan, September 19, 1985, is reviewed and analyzed. An IDA panel finds that the plan is a reasonable starting point, but finds problems in the areas of management, theme, strategy, execution organization, and in several of the STARS Area plans. The two major points are that the STARS program requires strong central direction with a controllable organization and strong clients and that a theme of marketplace stimulation rather than technology development should be adopted and made to permeate the program.

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Contract MDA 903 84 C 0031
Task T-4-236

1.0 EXECUTIVE OVERVIEW

The Director of the Computer Software Systems Directorate (CSSD) requested the Software Technology for Adaptable, Reliable Systems (STARS) Joint Program Office (SJPO) to have an assessment made of the STARS Program. Three concerns prompted the request: (1) the Program is to receive $42 million in FY86, (2) the perception that STARS is not effective, and (3) the absence of an effective top-down plan. An assessment was carried out by a panel convened during September and October 1985, by the Institute for Defense Analyses (IDA). A primary basis for the assessment was the STARS Program Plan dated 19 September 1985. This is the Executive Summary of the findings and recommendations of the panel. A larger companion document, Volume II: An Assessment of the STARS Program, September-October 1985, describes these in greater detail.

The panel consisted of people with varying levels of experience with STARS. The panel members were: Dr. Elizabeth Bailey, Dr. Richard DeMillo, Mr. Herman Fischer, Ms. Audrey Hook, Dr. John Kramer, Dr. Thomas Probert, Mr. Samuel Redwine, Dr. William Riddle, and Dr. Robert Winner. An additional group was briefed on the progress and findings of the panel on September 26, 1985. The members of this group were Mr. Joseph Batz, Dr. Barry Boehm, Mr. Bill Carlson, Dr. Neil Eastman, Mr. Joseph Fox, Dr. Ugo Gagliardi, Dr. Leonard Haynes, Dr. Ed Lieblein, and Dr. Edith Martin. In addition, the panel's preliminary conclusions were presented to a Defense Science Board Task Force on October 23, 1985.

While the panel found a number of major problems, it should be emphasized that the panel felt that the 19 September STARS Program Plan and the present state of the STARS Program were adequate starting points for arriving at a desirable and beneficial STARS Program.

The following is a list of the major problem areas and recommendations:

(1) The STARS Program cannot succeed with the current committee management approach. A strong centralization of authority is needed with associated spending and contracting capabilities.

(2) The STARS Program needs a concrete vision of how the defense community will operate in the mid-1990's along with an appropriate unifying theme outlining the contribution of STARS in achieving that vision.

(3) The current STARS theme is focused on developing improved software environments and promoting their widespread use. A major problem with this theme is that it does not lay the foundation for continued improvement after STARS.

(4) A new STARS theme is needed which focuses on exploiting the forces in the marketplace and directs Program activities on improving DoD's ability to buy products from the marketplace.

(5) Action must be taken to accelerate program execution. Planned activities that are consistent with this marketplace theme should be continued or hastened. Some activities should be adjusted and some terminated.

(6) The panel assessed each of the six technical areas: (1) Software Engineering Environments (SEE), (2) Methodology, (3) Application Specific, (4) Business Practices, (5) Human Resources, and (6) Measurement. Problems concerning incompleteness, inconsistency, and lack of coordination were found. Possibilities for improvement, which are consistent with the marketplace theme, have been outlined. The Business Practices Area is viewed as the most critical of the six areas.

(7) Attention must be rapidly brought to bear on obtaining intensive industry involvement in STARS activities.

Each of these points is discussed below.

2.0 MANAGEMENT ISSUES

2.1 Problem Areas

The STARS Program has been crippled by serious political, organizational, and management problems that must be resolved before any real progress in the substantive areas can be expected.

At all levels, the STARS Program has been subjected to management by committee. At the top level of the organization, there is an OSD/Tri-Service committee arrangement that has resulted in sometimes paralyzing conflicts over the distribution of authority and responsibility for the program. These conflicts have had serious consequences on program planning and execution and have drained the program of significant management attention and energy. Program-level decisions are being made by Service Managers acting as a committee with most recommendations coming from the bottom-up. The six areas are being planned and managed by committees consisting largely of non-dedicated personnel from service laboratories.

The lack of an effective hierarchical organization within the SJPO has acted as a further hindrance. Under the current organization, the STARS Director has no line authority over the Service Program Managers, their Deputies, or the leaders of the six Area Coordinating Teams (ACT's). With the exception of the Technical Director, all STARS personnel report to and are evaluated by people from outside of the SJPO. Clearly, this organization works against any kind of centralized program management. The lack of an effective management organization is paralleled by the lack of an effective executing organization. In particular, significant delays have occurred in transferring funds and initiating contracts.

2.2 Panel Recommendations

The areas requiring immediate attention are those involving the establishment of clear lines of authority and accountability as well as effective mechanisms for spending and contracting. The panel strongly recommends the following actions be taken immediately:

(1) Appoint and empower a STARS Program Director. The most immediate requirement is to identify, hire, and empower a strong permanent Director and to establish a tenable political situation for that Director. The STARS Director must be given control of the program.

(2) Resolve the contention between OSD and the Services. The current contention between OSD and the Service Program Managers over who is in control of the

STARS Program must be resolved quickly if the STARS Program is to survive. This resolution will require management attention at levels above CSSD and SJPO. This may require reprogramming the STARS budget as an OSD element.

(3) Give the STARS Director spending and contracting authority. The STARS Director must be given effective spending and contracting authority. The current checks-and-balances, distributed consensus approach to spending authority has not, and will not, work.

(4) Form an effective line management organization. A line organization with clear execution authority and accountability is critical to the Program's success. Several alternatives are suggested in Volume II.

(5) Establish effective administrative procedures. Effective administrative procedures must be established for contracting, tracking disbursements, preparing plans, reviewing plans, and reviewing accomplishments.

(6) Modify the role of the Area Coordination Teams. ACT's should be technical and advisory in nature rather than managerial.

3.0 VISION OF THE RESULT OF STARS

The ultimate goal of the STARS Program must be to ensure DoD's the ability to build and support the mission critical systems of the early 1990's. While doing this, the basis must be established for meeting software requirements in the years beyond this century. STARS is intended to be a program of finite length, ending with the institutionalization of the improvements it has fostered, and of the processes leading to further improvement.

In reviewing the September 19 Program Plan, the panel concluded that the current goals of the STARS Program are sound and important. The goals have remained largely unchanged since the pre-Raleigh period and have emerged as a result of intense critical examination and consensus building from government, industry and academia. Beyond general and abstract goals, STARS needs to operate within the context of a concrete vision of how the defense community should develop and support MCCR software in the early 1900's. The panel believes that the vision should be along the lines of that discussed below.

The defense community will be well ahead of potential adversaries, rapidly improving, and even widening the gap between them. Defense software will be meeting its requirements with the needed quality, on time, for reasonable cost, and doing so predictably. To do this, technology will be flowing smooothly into use in the U.S. defense community regardless of its commercial, academic, or government origin. Facilitating this flow will be a regulatory context that attracts the needed investments by providing equitable return for all parties (including the Government) and a marketplace for the resulting technology, particularly as embodied in software tools and in reusable MCCR software.

The DoD will be an intelligent buyer of software and investor in software technology. The marketplace will be broad and the Government will be able to obtain the best software and software technology, possibly obtaining different pieces or services from different vendors.

Every project will readily be able to establish an appropriate environment, or rapidly modify its existing environment to meet the needs of, and constraints upon, the project.

It will be possible to rapidly produce initial and subsequent versions of MCCR software. The productivity and quality will be greatly improved over the present MCCR software levels.

Key to the functioning of this marketplace will be standardized interfaces among environments that allow transfer of (at least) workproducts and (at most) all types of software tools and users. The compatibility provided by these interfaces, along with the use of suitable acquisition practices by the DoD, provides the bases for the success of the marketplace and the cumulative improvement of the community, allowing a competitive advantage to be reached by innovation rather than by "reinventing the wheel."

The ability to transfer software among Software Engineering Environments (SEE's) is additionally important to DoD because of the need to transfer software for logistics and because the reuse of software among DoD programs potentially provides great cost effectiveness.

4.0 STARS THEME

This vision of the result of STARS assumes the creation of a marketplace of competitive suppliers of methods, tools, MCCR software components, and related technologies. It also assumes that DoD, in return, will be an intelligent consumer of those products. The panel feels strongly that STARS should adopt and consistently operate within this marketplace theme.

The marketplace theme can be contrasted with the current theme of the STARS Program emphasizing the development of improved software environments. The main problem with this theme is that it focuses on the end-products to be achieved rather than on capturing a process for continued improvement. The result is an increment in capability without any provisions for further improvements.

In contrast, the theme of creating and using marketplaces is important because it lays the foundation for continued improvement after the inital improvements resulting directly from the STARS Program. It does this by attracting and leveraging investment from the private sector, by fostering a high degree of portability for software tools, by speeding the flow of technology into widespread use, and by supporting the reuse of software system components.

The marketplace theme is inherently a more difficult theme than one in which STARS simply pays for the development of new tools, systems, and related technology without considering how these developments will be used or how they will reduce costs in the future. Every project area undertaken by STARS will face the difficult decision of how much STARS must fund in order to ensure that a given capability will appear in the marketplace at the appropriate time. Must some concepts be demonstrated as feasible in order to encourage investment from the private sector? Must the value of some concepts be demonstrated to potential users? Must certain items be produced or purchased? What standards are required and when? What new business practices within DoD are needed to establish the consumer and producer side of a given market? These kinds of decisions will require close cooperation with industry and a keen awareness of political, entrepreneurial, and technical issues by the STARS leadership.

It is important to keep in mind that there are two marketplaces with which STARS must be concerned. One is the marketplace for software engineering tools and methods; the other is the marketplace for MCCR software components.

Creating a marketplace in software engineering tools and methods requires solving several problems. Chief among them is providing for technical compatibility through standardized interfaces. Other key issues are: (1) attracting investment from the private sector (being careful not to exclude small innovative firms), (2) instituting appropriate acquisition policies/practices, and (3) providing a comparative evaluation capability.

Creating a marketplace in MCCR software components requires solving many of the same problems that occur in the software engineering tools marketplace. In addition, a number or non-technical issues make the development of this marketplace complex, especially as it relates to reusable software. These issues include:

(1) Classified software

(2) Proprietary interests

(3) Rights in data (e.g., derivative works)

(4) Undesirable foreign technology transfer

(5) Libraries, warehousing, cataloguing and retrieval

(6) Support

(7) Incentives

(8) Royalties

(9) Making software a recurring business

Many of these issues have received attention within the STARS Program but much more effort is required before they are entirely solved. The Business Practices and Application-Specific Areas will be particularly critical in this regard. A number of marketplace issues are discussed in Volume II.

The results of an assessment of each of the STARS technical areas is contained in the following section.

5.0 STARS AREAS

5.1 General Issues

The STARS Program is currently divided into six areas:

(1) Business Practices

(2) Human Resources

(3) Software Engineering Environments (SEE)

(4) Application Specific

(5) Measurement

Each of these areas is represented by an Area Coordinating Team (ACT) staffed largely by personnel from DoD laboratories. Across areas, the teams vary widely in terms of the technical competency of their membership. The panel recommends that competency requirements be established for team membership and that the ACT's include experts from outside DoD as well. The role of the ACT's should be to serve as technical advisors to STARS management rather than their current role as project managers.

If the theme of the STARS Program shifts away from the current emphasis on developing production-quality environments to an emphasis on fostering a competitive marketplace, there will be a corresponding shift in the relative importance of the STARS areas. Under the marketplace theme, the Business Practices Area is the most important because of its concern with issues involved in stimulating the marketplace and defining the context for how DoD should conduct business within that framework. Under the current theme, the lion's share of the funding and attention is going into the SEE Area. Under the marketplace theme, the SEE Area is still important but, as discussed below, its role is to provide the compatibility framework and to undertake prototype developments rather than to build production-quality environments.

The emphasis of the other areas changes as well under the marketplace theme. The Human Resources Area takes on the difficult role of educating DoD personnel to be an intelligent consumer in the new marketplace and the task of discovering marketplace stimuli for the improvement of software engineering capabilities in the work force. The Measurement Area is important because of the need to objectively and quantitatively evaluate competing products and because of the need to assess the impact of STARS. The Application-Specific Area can serve to reduce risk for the DoD program manager by providing feasibility demonstrations which involve building MCCR systems from marketplace components. Finally, the Methodology Area can provide the capability for evaluating and selecting from methods and supporting tools in the marketplace.

The panel feels that the current set of six areas may not represent the optimal set for STARS under a marketplace theme. However, the panel also feels more critical problems must be solved immediately in the realm of program management and execution. Any kind of restructing of areas can wait until the Program is moving forward.

Regardless of which theme is adopted, there exist problems of inconsistency, incompleteness, and lack of coordination across the areas. Each of the areas is discussed in more detail below.

5.2 Business Practices Area

The Business Practices Area has been severely underemphasized. Its original purpose, as presented at the initial public review held at Raleigh, was:

(1) To develop the body of knowledge necesary for the DoD to act in the role of intelligent consumer.

(2) To develop a suite of program management tools to provide consistency and support across program phases and across programs and application areas.

(3) To propose changes to DoD regulations, practices, and standards appropriate to enhancing the DoD position in the business environment.

More recently, this Area has narrowed its focus on the acquisition of software and eliminated any emphasis on developing the knowledge to improve and exploit the DoD position in the commercial sector.

STARS must recognize that the Business Practices Area is the most powerful tool that the Program has to insert appropriate software technology into the DoD community. It is also the most difficult area in which to accomplish anything significant. The current level of funding does not reflect this and should be increased drastically.

The Business Practices Area should be concerned with the steps needed to stimulate the supplier side of the marketplace. One of the critical factors determining the success of the marketplace strategy is the extent to which investment can be attracted from the private sector. Investment behavior is the determined by degree of uncertainty or risk. DoD can help to reduce risk in two important areas: one is in conducting R&D to demonstrate feasibility and the other is to remove the uncertainty from its own future market-related actions and policies.

One of the goals of the STARS Program should be to attract investment and participation from a number of smaller firms from which one would expect a greater likelihood of high-quality, innovative products. Small firms can be attracted if they can enter the market with a product requiring relatively modest capital investment that will work compatibly with other products in the marketplace. This is one of the primary reasons that a compatibility framework is needed. In addition, the larger the market, the more attractive it will be to large and small investors. Technical compatibility beyond just the DoD community can thus be beneficial to DoD. These types of issues need to be addressed by the Business Practices Area and, in this instance, implemented by the SEE Area.

If STARS is to influence the marketplace, one of the first important steps will be to identify and foster cooperative relationships with the potential players on the supply side. At a minimum these players include the following:

(1) The major hardware manufacturers (e.g., IBM, DEC)

(2) System houses (e.g., Lockheed, General Electric)

(3) Software houses (e.g., CSC)

(4) Small start-ups whose future lies in high quality and innovation (e.g., Rational, Verdix)

(5) Standards and other professional organizations (e.g., ANSI, IEEE, EIA)

Clearly, the Business Practices ACT will require people with the needed expertise in marketplace issues, including lawyers and executives from the private sector. The Business Practices ACT must be closely coordinated with the remaining areas. In many cases, this area will drive the activities of the other areas.

5.3 Human Resources Area

The efforts within the Human Resources Area are divided into three activities. The first two try to establish the size of the current workforce and the workforce of the 1990's. The third concerns development of material and technology for education and training.

Within the marketplace theme, this area could have an additional job that will be much more challenging than just that of creating a workforce doing a "better" job of business as usual. Instead, the Human Resources Area could face the task of transforming the DoD into a consumer with the capability of evaluating and selecting from the marketplace in an intelligent manner. This would represent a very different way of conducting business and no less than a pervasive cultural change.

The major barriers to the success of the STARS Program will be political, organizational, social, and psychological even more than technical. Changing the behavior of individuals and organizations---especially those that are comfortable with the current way of doing business---can be expected to meet with varying degrees of resistance from many sources. If any area is capable of addressing these "people issues," it should be the Human Resources Area. This will involve the ability to anticipate these sources of resistance as well as likely advocates and formulate a strategy which takes both into account.

5.4 Software Engineering Environments (SEE) Area

The SEE Area is currently the major focus of attention of the STARS Program. The panel views it as overemphasized both in management attention and in funding during the year preceding September 1985. The panel feels that the strategy for the SEE-related activities presented in the 19 September STARS Program Plan is too oriented toward building environments as opposed to stimulating the marketplace to provide the environments.

The major contribution of the SEE Area should be a framework for constructing SEE's out of pieces or fragments. One motivation for doing this is to encourage participation by smaller firms who cannot afford to invest in entire toolsets or environments but can tackle one piece, with a substantial liklihood of doing that one piece very well. The panel proposes the following as the acquisition strategy for the SEE which has the advantage of providing a general framework for environments onto which generic tools (e.g., editors, compilers) can be added as well as application-specific tools. A key aspect of this strategy is to shift attention away from developing complete, wide-spectrum environments (at least under Government sponsorship) and toward the production of compatible toolsets.

The suggested approach is to interact with the commercial software development marketplace as an intelligent and powerful consumer. In order to stimulate the commercial sector to provide appropriate and sufficient responsiveness, the STARS Program must take four separate but related actions. These are:

(1) Reduce the risk of commercial participation by demonstrating technical feasibility through the development of necessary prototypes. These prototypes will be done commercially and made commercially available.

(2) Provide standards and guidlines for the development of tools, both prototype and production quality, that will be used in the toolsets.

(3) Announce an intention to acquire tools developed under commercial-sector support to be used in the toolsets.

(4) Modify government acquisition regulations and propose legislation, if neccessary, to allow commercial ownership of most of the products developed under this strategy.

The actual development and acquisition would follow a simple tactical plan which is outlined in Volume II.

5.5 Application Specific Area

Many of the problems outlined earlier in connection with creating a marketplace of MCCR software components are most appropriately addressed by the Application-Specific Area, particularly those involved in warehousing, cataloguing, and retrieving components. Another important contribution of this area should be feasibility demonstrations within specific application areas as a risk-reduction vehicle for DoD program managers.

The activities currently planned within the Application Specific Area are largely unrelated and disconnected from other areas. The former is not too surprising and may be justified by the need to demonstrate STARS in diverse applictions. It is important, however, that links with other STARS areas and other programs be institutionalized. There are some common aspects to the activities across areas and it is not clear that there is an activity that will coalesce the common experiences and adequately transfer the new knowledge.

5.6 Measurement Area

The current Measurement Area Plan (4 November 1985) contains some useful and needed activities, especially those involved in providing standard definitions for various measures and in developing a central database of measurement data. But there are also activities such as tool building, model development and calibration, and the development of training materials which are unlikely to increase the use of quantitative techniques because the incentives for that use are missing.

The primary aspect of the Measurement Area is to play a pivotal role in the marketplace strategy. Tools, methods, and other products will be successful in the marketplace only if they are of production quality and fully supported. The consistent use of metrics across the community will allow developers and the entire market to judge new products as well as to compare experience with new and older products. This will require an evaluation capability that relies on measurable characteristics, helps in certifying new marketplace entries, and assists in comparing among the various alternatives that will emerge. The panel feels that competent technical people in each activity area are the appropriate ones to formulate approaches to this aspect of measurement. The Measurement Area Coordinating Team can serve a vital role in ensuring consistency in the measures and measurement procedures used across areas.

The secondary aspect of the Measurement Area should be to assess the effectiveness of the STARS Program. The Measurement ACT must work with each team and with STARS management to establish measurable goals and suitable mechanisms to determine success.

5.7 Methodology Area

The Methodology Area addresses the problem of providing a variety of software creation and evolution approaches for use on DoD software projects. The overall intent is to broaden both the applicability of the collection of methods available for use and the extent to which they are actually used.

The activities of this area will result in the enhancement of existing methods and the development of new ones if warranted. The major focus of the area is, however, on developing capabilities for classifying, evaluating, and selecting methods, a focus which is consistent with the marketplace theme. These capabilities will provide direct help in the choice of a method to support a specific project. Development of the capabilities will help in identifying enhancement and additions to existing methods.

The area's plans generally seem adequate for the near term. However, much more concrete plans are needed for the medium-to-long term.

5.8 Additional Areas for Reconsideration

5.8.1 Systems Area

Systems Area was one of the original STARS areas at the time of the Raleigh workshop. The panel feels that the content of this area is of increasing importance to DoD and should be adequately covered. A new "Systems" initiative/program, bridging STARS and VHSIC, may be appropriate. In any case, STARS should include software-related systems concerns. For example, the emphasis on reliability/fault tolerance in the original Systems Area should not be lost.

5.8.2 Human Engineering Area

Human Engineering was also one of the original STARS areas at the time of the Raleigh workshop. It was broad in its concerns, covering not only human engineering of the SEE (including methods as well as tools) but also human engineering of MCCR systems for the end user. Human Engineering disappeared as a separate area of the STARS Program in 1984.

Human Engineering should be reinstated as an identifiable area. It requries expertise which lies more in the domain of the behavioral sciences than in computer science. Thus, it is unlikely to fall out of any of the other areas.

Consistent with the marketplace theme, the Human Engineering area should address the issues involved in specifying, evaluating, and selecting products of the basis of their usability. The area should also focus on the issues involved in establishing information interfaces to support independence between a user interface and the underlying tools or applications.

6.0 SUMMARY

The most critical problem facing the STARS Program is managerial and must be resolved immediately. The panel feels strongly that once this problem is addressed, STARS should adopt and consistently operate within a theme of marketplace stimulation. The marketplace theme is important because it leads to direct and extensive industry involvement in STARS. By developing products under private-sector investment and

letting the investors retain proprietary rights, industry should actively participate in achieving the Program's goals and objectives, with numerous benefits.

The strengths of the American free-enterprise system---including private initiative, competition, and the desire to make a profit---should be exploited. Industry understands the need to supply a fully-supported product and is motivated to get its products used. A marketplace-based strategy will therefore foster both follow-on support for products and a technology push from within industry. In addition, expertise other than that directly contracted for will be attracted to the solution of DoD problems.

Creating a marketplace of software engineering methods and tools and a marketplace of MCCR software components will require developing a customer base, developing a base of private investment, and developing a facilitating regulatory context. The marketplace theme is inherently a riskier alternative than the current approach of directly paying for the construction of several production-quality environments. The benefits are many times greater, not only for DoD, but for the nation as a whole because the foundation will be in place for the cummulative improvement of the entire industry. STARS must, however, be sensitive to the increased risk, both from the consumers' perspective and from the suppliers'.

The panel recommends that STARS management take a new look at the set of areas and their relative emphasis within the Program. The panel recommends that the superceded Systems and Human Engineering Areas be reconstituted. Having reviewed the areas and their relative levels of emphasis, management should review the constitution of the area teams and repeat this process periodically. The focus of the teams should be changed from a managerial to a technical orientation; management should be handled at higher levels.

WHY A STARS PROGRAM REVIEW?

- Why do a review?
  - -- Program to get $42M
  - -- Perception that STARS is not effective
  - -- No real top-down plan yet

REVIEW PANEL

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Dr. Edith Martin

MAJOR FINDINGS

- STARS cannot succeed with current committee management approach
- Immediate actions must be taken to establish an effective management organization with clear lines of authority and accountability

THEME

- STARS needs a concrete vision of the mid-1990's and a clear unifying theme
- The current theme (developing improved software environments) does not lay the foundation for continued improvement after STARS
- A new theme is neede which focuses on exploiting the forces in the marketplace

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MAJOR FINDINGS (CONT)

TECHNICAL AREAS

- The six technical areas suffer from problems of incompleteness, inconsistency, and lack of coordination. Recommended changes are outlined.

PROGRAM EXECUTION

- Action must be taken to get program execution underway
- Attention must be rapidly brought to bear on obtaining intensive industry involvement in STARS activities

MANAGEMENT ISSUES: PROBLEM AREAS

- At all levels, the Program has been subjected to management by committee
  - OSD/Tri-Service committee arrangement at the top level
  - Program-level decisions made by Service Managers acting as a committee
  - Each of the six technical areas planned and managed by committee
- STARS Director has no line authority
- Executing organization is not effective

MANAGEMENT ISSUES: PANEL RECOMMENDATIONS

- The following actions must be taken immediately
  - Appoint and empower a STARS Program Director
  - Resolve the contention between OSD and the Services
  - Give the STARS Director spending and contracting authority
  - Form an effective line management organization
  - Establish effective administrative procedures
  - Modify the role of the ACTs to be advisory rather than managerial

VISION OF THE RESULT OF STARS

- Defense software will be meeting its requirements with the needed quality, on time, for reasonable cost, and doing so predictably
- There will exist marketplaces in :
  - Tools, methods and environments
  - Reusable end-use MCCR software
- DoD will be an intelligent software buyer (and investor)
- DoD will have the ability to rapidly establish (for each project) an up-to-date, powerful, integrated environment with appropriate tools and methods
- DoD will have the ability to rapidly create MCCR software
- There will be at least an order of magnitude of improvement in productivity and reliability
- The key to the new marketplaces will be technical compatibility provided by interface standards

STARS THEME

- This vision of the future assumes the creation of a marketplace of competitive suppliers of methods, tools, MCCR software components, and related technologies.
- STARS should adopt this marketplace theme.
- Current theme is focused on developing improved software environments. This can lead to an incremental improvement but does not capture the process leading to continued improvement.
- In contrast, the marketplace theme does lay the foundation for continued improvement by:
  - attracting and leveraging investment from the private sector
  - fostering a high degree of portability for software tools
  - speeding the flow of technology into widespread use
  - supporting reuse of software system components
- Marketplace theme is more difficult and involves greater risk.

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TWO MARKETPLACES

- Software engineering tools and methods. Problems in creating this marketplace include:

  - providing for technical compatibility through standardized interfaces
  - attracting investment from the private sector
  - instituting appropriate acquisition policies/practices
  - providing a comparative evaluation capability

- MCCR end-application software components. Problems associated with this marketplace include those listed above plus:

  - classified software
  - proprietary interests
  - rights in data (e.g., derivative works)
  - undesirable foreign technology transfer
  - libraries, warehousing, cataloguing, retrieval
  - support
  - incentives
  - royalties
  - making software a recurring business

AREA COORDINATING TEAMS

- Technical competency requirements should be established
- Experts from outside DoD should be included
- Role of the teams should be technical not managerial

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EMPHASIS ACROSS AREAS

- Under marketplace theme, there will be a shift in relative emphasis across areas
  - Business Practices is the most important, not SEE
- Current set of six areas may not be optimal for marketplace theme but restructuring can wait
- Regardless of theme, there are problems of inconsistency, incompleteness, and lack of coordination across areas

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BUSINESS PRACTICES AREA

- Severly underemphasized
- Most important area and also most difficult
- Funding should be increased
- This area should be concerned with stimulating supply side and defining new ways for DoD to conduct business within the marketplace
  - Must attract investment from the private sector
  - Must foster cooperative relationships with industry (including innovative small firms)
- Business Practices ACT requires marketplace expertise

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HUMAN RESOURCES AREA

- Current activities include
  - Establishing the size of the current and 1990's workforce
  - Development of educational material and technologh
- Under marketplace theme, area should also be concerned with transforming DoD into an intelligent and powerful consumer in the marketplace

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SOFTWARE ENGINEERING ENVIRONMENTS AREA

- Currently the main focus of the STARS Program
- Overemphasized in funding and in management attention
- Major contribution of SEE should be a compatibility framework, not production-quality environments
- Panel has proposed an acquisition strategy for the SEE Area which shifts attention away from developing complete, wide-spectrum environments and toward production of compatible toolsets
- Proposed strategy is consistent with marketplace theme

APPLICATION-SPECIFIC AREA

- Should address problems involved in creating a marketplace of MCCR components (e.g., warehousing, cataloguing, retrieving)
- Should support feasibility demonstrations within specific application areas as a risk-reduction vehicle for DoD program managers

MEASUREMENT AREA

- Current plan for Measurement Area contains some useful activities, especially
  - Providing standard definitions for measures
  - Developing a central database of measurement data
- Measurement can plan a crucial role in marketplace strategy
  - Provides basis for comparative evaluation of products
  - Also provides basis for assessing impact of the STARS Program as a while (important under any theme)

METHODOLOGY AREA

- Focused on developing capabilities for classifying, evaluating, and selecting methodologies
- Consistent with marketplace theme

SUSPENDED AREA: SYSTEMS

- One of original areas at Raleigh
- Content is of increasing importance to DoD and should be covered perhaps through new "Systems" Initiative/Program bridging STARS and VHSIC
- STARS should include systems concerns (e.g., reliability/fault tolerance)

SUSPENDED AREA: HUMAN ENGINEERING

- One of original areas at Raleigh
- Should be reinstated
- Requires behavioral-science expertise and is unlikely to fall out of any of the other areas

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